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ABSTRACT

A study investigated whether instruction in spelling would affect acquisition of the alphabetic strategy by beginning readers. Subjects, 28 beginning first- and second-graders of average or above-average intellectual ability in whole language classrooms, participated in small group training for two 20 minute periods a week for 6.5 months. Experimental subjects were given segmenting/spelling tasks, while controls were trained to read letters, words, and text. Both groups used computers. Results indicated that trained subjects made significant early gains in using alphabetic strategy and were significantly better than controls by the end of the study at reading regular and irregular nonsense and real words, and at oral passages, but not at silent comprehension. Findings suggest that spelling may affect reading through the mapping of sounds onto letters. (Two tables of data are included; 40 references are attached.) (Author/RS)

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The Effect of Segmentation/Spelling Training on the Acquisition of Beginning Reading Strategies

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Running head: Beginning Reading Strategies

Abstract

This pretest-posttest training study was based on Frith s (1985) model of reading stage acquisition in which use of an "alphabetic" or phonetic strategy occurs first in spelling and later in reading. It was hypothesized that instruction in spelling would affect acquisition of the alphabetic strategy. Subjects (N = 28) were beginning 1st and 2nd graders of average or above average intellectual ability in "whole language" classrooms. Small group training involved two 20 minute periods a week for six and a half months. Experimental subjects were given segmenting/spelling tasks, while controls were trained to read letters, words, and text. Both groups used computers. Trained subjects made significant early gains in using the alphabetic strategy and were significantly better than controls by the end of the study at reading regular and irregular nonsense and real words, and at oral passages, but not at silent comprehension. Results suggest that spelling may affect reading through the mapping of sounds onto letters.

The Effect of Segmentation/Spelling Training on the Acquisition of Beginning Reading Strategies

Spelling was used for hundreds of years to teach beginning reading (Venezky, 1980). Since the 1930's, however, a more eclectic, meaning-based approach has been taken (Chall, 1967). Intensive direct reading instruction using phonics and spelling have tended to occur in remedial programs (e.g., Cox, 1980; Traub & Bloom, 1975) rather than in mainstream classrooms. At present the trend is toward a "whole language" approach in which the child is expected to infer phonetic patterns from trade books and from invented spellings without formal, sequential instruction. However, there is support in the literature from Frith's theoretical model (1985, 1986) and from researchers who are advocates both of direct instruction in phonics (Bradley & Bryant, 1983; Ehri & Wilce, 1987a), and of invented spelling (Graves & Stuart, 1985), to suggest the usefulness of spelling in the teaching of beginning reading strategies.

Frith's (1985, 1986) model of reading acquisition is based on Marsh's four decoding stages (Marsh, Friedman, Welch, & Desberg, 1980), and provides a theoretical base for the use of spelling. In the first stage, which Frith calls "logographic," context is crucial, letter order is ignored, and a few whole words are memorized. This logographic strategy is similar to that described by Ehri (Masonheimer, Drum, & Ehri, 1984) as the "visual cue" stage in which XEPSI on a Pepsi bottle is read as "Pepsi". Frith ignores Marsh's second stage in which some words are guessed from

a combination of context and partial phonetic cues. Ehri and Wilce (1987b) describe a second stage as "phonetic cue" reading in which only partial phonetic cues are used. Marsh discusses a "substitution" strategy, used in both of these early stages, in which a known word which makes semantic and syntactical sense is substituted for the unknown word.

At the next stage, which Frith calls "alphabetic," the reading strategy involves systematic left-to-right, letter-by-letter decoding using grapheme-phoneme associations which are blended into words. Ehri and Wilce (1987a, 1987b) use Gough's term "cipher" reading for this stage (Gough, Juel, & Roper/Schneider, 1983). Phonetically regular short vowel words which are variations of the consonant-vowel-consonant or "cvc" pattern (e.g., at, hop, sled, milk, slump) lend themselves best to the alphabetic strategy because letter sounds do not vary depending on surrounding letters and words can be read by blending letter sounds sequentially. Because nonsense words contain only phonetic cues, they are often used as the criteria for alphabetic reading.

In Frith's third phase, "orthographic" reading involves the analogical use of automatically recognized letter strings. This strategy can be used with short vowel words. For example, once bat and cat have been sounded out a number of times, the unit at might be recognized in the word hat. The strategy can also be used to read words with letters which vary in sound depending on surrounding letters. For instance gypsy can be read through analogy to gym, and bright through analogy to high.

Frith's contribution to this model of developmental reading strategies is her insight into the movement from one stage to the next. She presents a refinement of Marsh's and Ehri's models in that there are two distinct steps at each stage. At the onset of a stage either reading or spelling leads, and at the second step they are integrated. In the logographic stage reading takes the lead, in the alphabetic stage spelling precedes reading, and in the orthographic stage reading leads spelling.

In other words, beginners continue to use a logographic strategy for reading after they have started using an alphabetic strategy for spelling. There is evidence of phonetic spelling preceding reading found in studies of prereaders's invented spellings (Bissex, 1980; Chomsky, 1971, 1979; Clay, 1975; Graves & Stuart, 1985; Read, 1971). Mann, Tobin, and Wilson (1987) argue from their results that early invented spellings can predict later skills in reading.

If spelling instruction does facilitate an alphabetic strategy in beginning reading, it may be because it teaches children to segment speech sounds as they map them onto printed letters working from left to right. There is evidence to suggest that the early invented spellings of young children are associated with "phonemic segmentation" or skill in analyzing spoken words into phonemes (Liberman, Rubin, Duques, & Carlisle, 1985), and a number of literature reviews (e.g., Blachman, 1983; Lewkowicz, 1980; Stanovich, 1982, 1986; Vellutino, 1979) discuss the strong association between phonemic segmentation and reading.

The most convincing evidence for the use of

segmentation/spelling training comes from two training studies with young children. Bradley and Bryant's (1983, 1985) dramatic longitudinal study, which involved sound categorization using rhyme and alliteration, included a condition in which plastic letters were used to sound out and spell words, and this was the most effective of their four conditions.

Ehri and Wilce (1987b) used a similar technique when they trained four- and five-year-old prereaders to spell over a period of several weeks prior to reading instruction. Subjects segmented oally presented real and nonsense words, and then represented the sounds with letter tiles in simplified spellings. Trained subjects later learned to read other words composed of these letters more efficiently than controls who were trained only in letter-sound associations. Ehri and Wilce concluded that spelling training helped their beginners learn to read.

Thus, both Frith's model and evidence from training studies suggest that spelling is a promising method for teaching beginning reading. It was the purpose of the present study to test Frith's model in two ways. First, building on Frith's notion that alphabetic spelling leads alphabetic reading, we trained beginning readers in segmentation/spelling. Computers and small wooden blocks were both used as analogs of Ehri and Wilce's (1987b) tiles and Bradley and Bryant's (1983) plastic letters. We expected that trained subjects would use the alphabetic strategy to read phonetically regular short vowel words sooner and more effectively than controls.

Second, we expected that this advantage in alphabetic reading

would be followed by a later advantage in orthographic reading and in the stages which follow the acquisition of decoding. According to Chall (1983) the latter involves fluency followed by increases in comprehension.

Method

Subjects

Subjects were 28 New York City independent school first and second graders from predominantly white, middle class, English speaking, college educated families. Stratified random assignment was used in forming two treatment groups, with strata based on screenings and on teacher estimates of reading potential. Descriptive statistics are presented in Table 1 and suggest that

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Insert Table 1 about here.

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the two groups did not differ significantly in age, on measures of general intellectual ability and listening comprehension, or on a measure predictive of reading failure (Jansky, 1972). Distribution was even across classrooms, and there were seven girls and seven boys in each treatment group.

Design

A pretest-posttest control group design was employed in comparing scores on various reading measures. Analysis of all but one measure used a 2 (groups) x 4 (times of testing) mixed factorial analysis of variance (ANOVA) with repeated measures on the second factor. Reading comprehension scores were collected only once and analyzed using analysis of covariance (ANCOVA) with

a readiness form of the test serving as covariate.

Screening Measures for Grouping

The Screening Index (Jansky, 1972) was administered to all 22 first graders, either in May or in September before the study began. Total (adjusted) scores were used to identify children at risk for reading failure for stratification groups. The Reading Comprehension subtest of the Stanford Achievement Test (SAT), was administered to second graders prior to the study, and used, along with teacher nomination, to identify the six low reading second graders. The Slosson Intelligence Test was administered to all subjects prior to training for purposes of grouping. The Listening Comprehension subtest of the SAT was administered to all subjects near the end of the study with raw scores used to verify lack of group differences on this variable.

Pretest-Posttest Measures.

The following, except as noted, were administered four times over the course of the study, in early October, early December, late February, and early May, and used for repeated measures ANOVA's. Nonsense word reading was measured using raw scores from the Word Attack Test of the 1973 Woodcock Reading Mastery Tests and word reading was measured using raw scores from the Word Identification Test of the Woodcock. Subsets of items from these two tests were analyzed separately, with each test divided into cvc words which can be read alphabetically, and non-cvc words which are less alphabetically regular. The four subsets consisted of 31 cvc nonsense words (e.g., ift, bim) 19 non-cvc nonsense words (e.g., knap, hode), 25 cvc words (e.g., up, jump), and 125

non-cvc words (e.g., cake, night). Oral reading of passages involved alternate forms A-D of the 1967 Gray Oral Reading Tests. Gray Oral "passage scores" are based on both accuracy and speed. Silent reading comprehension was measured using raw scores from the 1978 Gates-MacGinitie Reading Tests with Basic R, Form 1 as pretest in order to provide the covariate in a one way analysis of covariance, and Level A, Form 2 as posttest.

Treatment

Training for both groups. Training supplemented classroom instruction which included phonics, but which was primarily a "whole language" approach with emphasis on shared reading of trade books, and on child generated stories with invented spellings. Treatment was administered to first graders in groups of five or six and to second graders in groups of three. Each group participated in two 20 minute sessions each week. Content involved the same sequence of letter sounds and words from Recipe for Reading (Traub & Bloom, 1975) briefly introduced in classrooms each Monday. Consonants and short vowels were introduced and combined in cvc words from September through January. Consonant blends and digraphs were introduced late in January, silent e late in March, and vowel digraphs in May.

Undifferentiated training for both groups began in September with practice in letter-sound associations using the Orton-Gillingham oriented Initial Reading Deck (Cox, 1971). This was to guard against effects from lack of equivalence in automatic letter-sound response. Keyboard instruction was given to both groups. Pairs of children used the 20 column version of the Bank

Street Writer III on three Apple IIe computers. Undifferentiated training lasted until mid October.

Experimental Treatment: Segmenting/Spelling. Instruction for experimental subjects involved using blocks and computers for segmenting and spelling. Work with one inch wooden blocks comprised about the first eight minutes of each training session. As a group, subjects listened to a word, echoed it, said each phoneme aloud while representing it with a block, and then said the word again. Then each subject took a turn segmenting a word individually. All children were given immediate feedback and poor segmenters were given extra turns until they were successful. By late November red blocks were used for short vowel sounds and blue for consonant sounds. Beginning in January, small round stick-on labels with letters were attached to the red and blue blocks.

Following work with the blocks, at each session experimental subjects moved to computers for dictation similar to the Alphabetic Phonics "SOS" (Cox, 1980). Children were asked to listen as a word was said, to echo it back, to spell it aloud, and then to write it and read it back on the computer. This was checked by his or her partner, and then the roles were reversed for the next word. By January the words were typed directly into a game with programming capability, such as Magic Spells; programming provided both segmenting and spelling practice. Thus the game phase of each session began with practice on the particular pattern being taught that week. Once these words had been practiced, each pair of subjects chose a second and often a third game to play. All experimental group games involved some

form of spelling or the analysis of sounds in words. Some, such as the spelling phase of Hint and Hunt, had speech synthesis so that subjects responded to a spoken word by analyzing sounds and representing them with letters. Others lacked speech synthesis and involved spelling to label pictures, as in one of the Reader Rabbit formats.

Control Treatment: Reading. Controls were also given 20 minutes of training twice a week. They read, but did not segment or spell, the same classroom word list used by experimental subjects. Word lists were read to mastery which often involved extra turns for poor readers. Controls were also taught to type letters on the computer in response to spoken sounds, but did not segment them from words. In addition, control subjects read the target words on the computer screen.

Computer games were used for the last portion of each training session. Games were offered which reinforced sight word acquisition (e.g., Sticky Bear Opposites and Sticky Bear Reading), which encouraged shared reading of meaningful text with prompts using speech synthesis (e.g., Talking Text Library), and which reinforced the use of reading for following directions (e.g., Town Builder).

Results

Means and standard deviations for the two groups at each time of testing on all six measures are presented in Table 2.

Insert Table 2 about here.

CVC Words.

In order to examine differences in the use of the alphabetic strategy between groups over time, scores from cvc nonsense and real words were analyzed, in each case using 2 (groups) x 4 (times of testing) mixed factorial analyses of variance (ANOVA), with repeated measures on the second factor. Note that for this and subsequent repeated measures ANOVAS, only the group x time interaction is of interest. Results for cvc nonsense words (e.g., *ift*, *bim*) indicate a significant interaction between group and time, F (3, 78) = 18.55, $p < .0001$. Follow up simple effects comparisons between consecutive times of testing within each group indicate significant gains for both the experimental group, F (3, 39) = 65.55, $p < .0001$, and for the control group, F (3, 39) = 10.31, $p < .0001$. Scheffé contrasts indicate that both groups made significant gains between Times 1 and 2, but that only the experimental group continued to make significant gains between Times 2 and 3 and between Times 3 and 4. This suggests an initial gain for both groups as the result of exposure to reading instruction, and continuing gains for the experimental group as the result of segmentation/spelling training. Additional simple effects comparison between groups at each time of testing indicate that by Time 3, in late February, the experimental group was significantly better, F (1, 26) = 6.65, $p < .05$, than controls, a difference which was even greater by Time 4 of testing in May, F (1, 26) = 30.57, $p < .0001$.

Results of repeated measures ANOVA on scores for cvc real words (e.g., *up*, *jump*) also indicate a significant interaction

between group and time, F (3, 78) = 5.70, $p < .001$. Follow up simple effects comparisons between consecutive times of testing within each group indicate significant gains for both the experimental group, F (3, 39) = 56.09, $p < .0001$, and for the control group, F (3, 39) = 22.39, $p < .0001$. Scheffé contrasts indicate significant gains for experimental subjects between Times 1 and 2, for both groups between Times 2 and 3, and for neither group between Times 3 and 4. Other simple effects analyses indicate that by Time 4 the experimental group was significantly better than controls at reading short vowel words in lists, F (1, 26) = 11.72, $p < .005$). This suggests an advantage, established during the early weeks of instruction, for subjects trained in segmentation/spelling.

Both of these analyses suggest that trained subjects had an advantage over controls in acquiring Frith's alphabetic strategy by the end of the study, with the advantage occurring earlier for nonsense words.

Non-cvc Words

Similar analyses were conducted for the less alphabetically regular non-cvc nonsense and real words which presumably need to be decoded orthographically. Results for nonsense words which cannot be read using a one-to-to correspondence strategy (e.g., knap, hode) indicate a significant interaction between group and time, F (3, 78) = 17.22, $p < .0001$. Simple effects analyses showed that significant gains were made by the end of the study by both the experimental group, F (3, 39) = 31.44, $p < .0001$, and the control group F (3, 39) = 2.99, $p < .05$. For the control group

there were no significant gains between consecutive times of testing, while the experimental group made significant gains between Times 3 and 4, and were significantly better at reading irregular nonsense words than were controls at Time 3, F (1, 26) = 5.32, $p < .05$ and at Time 4, F (1, 26) = 26.31, $p < .0001$.

The second subset here consisted of less alphabetically regular, or non-cvc, real words, such as cake and night, which cannot be sounded out from left to right one letter at a time. Results indicate a significant interaction between group and time, F (3, 78) = 13.59, $p < .0001$. Follow up indicated significant gains by the end of the study for both the experimental group, F (3, 39) = 48.77, $p < .0001$, and the control group F (3, 39) = 24.47, $p < .0001$. Scheffé contrasts indicate that neither group made significant gains between Times 1 and 2, that both did between Times 2 and 3, presumably as the result of exposure to classroom instruction, but that only the experimental group did between Times 3 and 4, presumably as the result of segmentation/spelling training. In addition, by the end of the study trained subjects were significantly better at reading these alphabetically less regular real words than were controls, F (1, 26) = 9.33, $p < .01$.

With both nonsense and real non-cvc words, then, there was an advantage for trained subjects suggesting that the orthographic strategy responded to segmentation/spelling training. However, significant gains here for trained subjects emerged later than they did on cvc words.

Oral Passage Reading

Results of repeated measures ANOVA of oral passage reading indicate a significant interaction between group and time, F (3, 78) = 4.23, $p < .01$. Follow up simple effects comparisons between means at consecutive times of testing within each group indicated significant gains for both the experimental group, F (3, 39) = 33.46, $p < .0001$, and the control group, F (3, 39) = 11.15, $p < .0001$. Scheffé contrasts for adjacent time periods suggest a pattern similar to that for irregular real words: neither group made significant gains between Times 1 and 2, both did between Times 2 and 3, and only the experimental group continued to gain significantly between Times 3 and 4. Simple effects comparisons indicated a significant difference at Time 4, F (1, 26) = 4.67, $p < .05$), with the experimental group (M = 17.0) superior to the control group (M = 9.6) in terms of reading passages aloud.

Silent Reading Comprehension

One way analysis of covariance (ANCOVA) was used to compare group performance on the Gates-MacGinitie Reading Tests, Level A, at the end of the study, with the October administration of the readiness level of the Gates used as a covariate. While the experimental group appeared to be performing at a higher level by the end of the study this difference was nonsignificant.

Thus, results show that, as predicted, the earliest effect of training was an advantage in reading alphabetically regular short vowel words with later gains for trained subjects in reading words which must be read orthographically and in oral passage reading. However, differences in reading comprehension were nonsignificant.

Discussion

Development of the Alphabetic Strategy

Ehri and Wilce (1987b) found that with a month of training, kindergarteners learned to read words with simplified spellings more accurately than controls, leading one to expect superior performance for trained subjects here, and this turned out to be the case. However, error analysis in the Ehri and Wilce study suggested that their preschoolers were using a phonetic cue strategy where letter-sound associations are combined with memory for specific words over several trials. Successful reading of short vowel nonsense words here, where our first and second graders were given only one trial, implies the presence of Frith's alphabetic strategy.

Error analysis suggests that controls not only read fewer words correctly, but that they were using a less sophisticated strategy. Treiman and Hirsh-Pasek (1985) suggest that a measure of the internalization of the alphabetic strategy can be found in the tendency to use all available letter cues rather than guessing from parts of words, and that dyslexics' errors tend to involve real word guesses. This guessing strategy is similar to Ehri and Wilce's (1987a) phonetic cue strategy, a step between Frith's first and second strategies. By the end of the present study there was a greater tendency on the part of controls to misread nonsense words as real words containing letters in common. They misread nonsense words as real words twice as often as experimental subjects did. Errors included misreadings such as "built" for bim, "rugs" for raved, and "concentration" for

conration. This suggests that not only were controls reading fewer words but that this was so because they were not using the alphabetic strategy as consistently as trained subjects.

These early gains for trained subjects in reading short vowel words were followed by later gains in irregular words. This confirmed our prediction that segmentation/spelling training would lead beginners into earlier and more successful use of the orthographic strategy. This suggests that increased awareness of phoneme-grapheme mapping and the strategy of reading all the letters in a word carefully made trained subjects more sensitive to strings of letters (e.g., old, igh, tion) which were not explicitly taught. There is anecdotal evidence of this in experimental children's comments, such as, "I knew it was smolder because it has old in it," or, "It's dignify - I can tell because it's like dignity." This strongly suggests Frith's orthographic strategy, in that units of print are read and combined through the use of analogy.

Passage Reading

In order to understand the implications of superiority with these two strategies in terms of passage reading, we need to look beyond Frith's model for the acquisition of decoding. Chall (1983) presents a more comprehensive model including decoding in Stage 1 (grades 1-2), fluency or automaticity in Stage 2 (grades 2-3), and comprehension based strategies in Stage 3 (grades 4-8) and beyond. At Stage 2, skills in word decoding are practiced and built upon as children learn to read phrases rather than word by word, learn to read silently rather than aloud, and begin to make

the transition to reading for comprehension. Two questions grow out of the dramatic group differences in word reading. Was this strategy generalized to use in timed oral passages where automaticity becomes a crucial factor, and did the advantage in decoding have an effect on comprehension? In other words, did this advantage in decoding affect entry into Chall's Stages 2 or 3?

Bradley and Bryant's (1983) results suggest that the advantage in phonetic decoding would affect the reading of oral paragraphs, and this turned out to be the case. There was a diminished training effect for oral passages relative to the dramatic effects for both types of nonsense words and for alphabetic real words; the pattern of gains for trained subjects here was similar to that for irregular real words in that they emerged relatively late. However, trained readers were superior to controls on oral passages after six and half months of training. This timed passage reading task requires both word attack skills and automaticity. There is a progression here, from use of the letter by letter alphabetic strategy, to the orthographic reading of strings of letters, and finally to automatic reading of words and phrases.

Reading Comprehension

Whether or not group differences in silent reading comprehension would emerge was difficult to predict from the literature. No measurement of comprehension was taken by Bradley and Bryant (1983) or Ehri and Wilce (1987b). One study in which a comprehension measure was taken after a year of reading training

with first graders was reported by Jansky (1981). Although her training was quite different from that used here, the results were similar. By May, trained subjects were better than controls at decoding words and oral sentences but not at silent reading comprehension. Findings in the present study are consistent with these results.

At first there may seem to be a contradiction in logic when the findings from these studies are considered in the light of extensive correlational evidence, summarized by Stanovich (1986), suggesting that early variance in phonemic segmentation and decoding are associated with later variance in comprehension. Furthermore, the fact that there were no group differences in listening comprehension makes the lack of reading comprehension differences even more puzzling if one assumes Gough and Tumner's (1986) "Simple View" in which decoding and listening comprehension are the two contributors to reading comprehension.

One needs to look carefully at the evidence on which this apparent contradiction is based. In correlational research, such as a study by Juel, Griffith and Gough (1986), children who were better comprehenders at the end of the first grade year had been better decoders from the beginning of first grade. In the present training study, in which a group of children was trained to be better at decoding, the advantage in oral passage reading was not achieved until around the same time as the comprehension measure was taken.

Again, Chall's model is useful here. At her Stage 2 skills in word decoding are practiced and built upon as children learn to

read phrases rather than word by word, learn to read silently rather than aloud, and begin to make the transition to reading for comprehension. What is not taken into account by apparent contradictions in evidence from correlational and experimental studies is the year and a half of practice for fluency in Chall's Stage 2. If a model is assumed in which decoding needs not simply to be achieved but to be maintained and refined over time, then there is not really a contradiction.

This explanation is supported by the discrepancy in this study between early, dramatic group differences in phonetic decoding of short vowel words, and relatively smaller and later differences in oral passage reading. Nonsense word decoding differences emerged by March, whereas differences in oral passage reading were not seen until May. Oral passage reading is exactly the skill one would expect to see improving with practice during Chall's Stage 2. Had the study continued, group differences in oral passage reading should have widened, to be followed by differences in comprehension. However, the complex relationship between decoding competence and comprehension cannot be fully explained by results of the present study.

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Table 1

Means and Standard Deviations on Screening Measures.

	Experimental Group		Control Group		
	M	SD	M	SD	t
1st graders only	(n = 11)		(n = 11)		
Jansky score	58.7	12.96	60.7	8.14	0.49
All subjects	(n = 14)		(n = 14)		
Slosson score	125.8	17.28	123.4	16.09	0.26
Age in mos.	79.4	4.97	80.3	7.50	0.32
SAT Listening	23.3	2.97	23.4	3.30	0.10

Table 2

Mean Reading Scores by Treatment and Time

	Time							
	1		2		3		4	
	M	SD	M	SD	M	SD	M	SD
Word Attack: cvc								
Exp	5.4	6.59	13.6	6.74	20.0	6.46	26.9	4.88
Con	6.6	7.06	12.6	7.63	13.7	6.44	13.29	7.78
Word Attack: non-cvc								
Exp	2.1	4.13	3.2	5.90	6.4	4.55	12.0	4.49
Con	1.9	3.18	2.8	4.89	2.86	3.39	3.7	4.05
Word Identification: cvc								
Exp	6.6	7.70	11.8	6.24	17.6	4.48	20.6	3.50
Con	7.4	7.57	10.5	5.79	14.7	5.28	15.1	4.98
Word Identification: non-cvc								
Exp	13.7	21.69	20.3	27.27	36.5	23.98	57.4	22.48
Con	14.1	21.84	17.6	22.46	26.8	21.31	31.2	22.81
Gray Oral								
Exp	5.6	8.83	6.6	9.52	12.9	10.39	17.0	10.08
Con	3.8	6.89	4.7	6.40	8.9	9.16	9.6	7.99
Gates								
Exp	35.8	9.22					67.1	15.92
Con	36.4	8.04					60.1	18.25

Note. In all cases $n = 14$.